WHAT IS CLAIMED IS

1. A process for producing nanocarbon materials, comprising the following steps:

a. providing a catalyst with a particle size of ≤10 nm and a surface area greater than 50 m2/g;

b. reacting carbonaceous feedstocks in the presence of the catalyst over a given period of time to produce carbon nanofibers with over 99% purity and a morphological selectivity approaching 100% in yields ≥140g carbon/g catalyst with higher reactivity.

2. The process in claim 1, wherein the catalyst is a metal oxide catalyst selected from the metals including iron, nickel, cobalt, lanthanum, gold, silver, molybdenum, iron-nickel, iron-copper and their alloys.

3. The process in claim 1, wherein the catalyst is prepared to specific parameters (size distribution, composition and crystallinity)specified and via a flame synthesis process.

4. The catalyst in claim 1, wherein the catalyst possesses a single crystal morphology.

5. The process in claim 1, wherein the yield of carbon nanomaterial resulted in ≥140gcarbon per g/catalyst.

6. The process in claim 1, wherein the morphology of the carbon micro structure can be selectively controlled to achieve various desired orientations in selectivities of ≥90%.

7. A process for producing nanocarbon materials, comprising the following steps:

a. providing a metal oxide catalyst with a particle

size of about ≤10 nm and a surface area greater than 50 m2/g;

b. reacting carbonaceous feedstocks in the presence of the catalyst over a given period of time to produce carbon nanofibers with over 99% purity and a morphological selectivity approaching 100% with yield ≥140g carbon/g catalyst.

8. The process in claim 7, wherein the reaction took place at a temperature not exceeding 550 C.

9. The process in claim 7, wherein the purity of carbon nanofibers was ≥99% after 8 hours reaction time.

10. The process in claim 7, wherein the metal oxide catalyst is selected from a group of metals including iron, nickel, cobalt, lanthanum, gold, silver, molybdenum, iron-nickel, iron-copper and their alloys.

11. Carbon nanofibers of high purity and high reactivity, produced by the steps of:

a. providing a metal oxide catalyst with a particle size of ≤10 nm and a surface area greater than 50 m2/g;

b. reacting carbonaceous feedstocks in the presence of the catalyst over a given period of time to produce the carbon nanofibers with over 99% purity and a selectivity approaching 100% with higher reactivity.

12. The carbon nanofibers produced by the process in claim 11, wherein the metal oxide catalyst is selected from a group of metals including iron, nickel, cobalt, lanthanum, gold, silver, molybdenum, iron-nickel, iron-copper and their alloys.

13. The carbon nanofibers produced by the process in claim

11, wherein the purity of carbon nanofibers was ≥99% in after 8 hours reaction time.

14. A carbon nanofiber, of the type produced in the presence of an metal oxide catalyst, the carbon nanofiber comprising at least 99% pure carbon, and produced at high yield, and >90% morphological selectivity.

15. The carbon nanofiber in claim 14, wherein the metal oxide catalyst is selected from a group of metals including iron, nickel, cobalt, lanthanum, gold, silver, molybdenum, iron-nickel, iron-copper and their alloys.

16. A carbon nanofiber composition exhibiting 90% Selectivity to a single morphology as produced.

17. The composition in Claim 16, wherein the morphology comprises graphene layers oriented parallel to the fiber axis.

18. The composition in Claim 16, wherein the morphology comprises graphene layers oriented perpendicular to the fiber axis.

19. The composition of Claim 16, wherein the morphology comprises graphene layers oriented at a specific and equal (±10°)angle to the fiber axis.